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## SCIENCE IN FRANCE

By Professor PIERRE BOUTROUX

THE very title of this article seems to imply two preliminary assumptions which many modern readers will be inclined to question. First, that in this time of technical achievements and highly specialized work, there still exists such an entity as "Science," distinct from the various sciences. Second, that when industry, commerce, politics, even literature, become more and more international in their scope and character, science may still be considered as some sort of national enterprise.

I have no intention to ignore the questions thus raised. But the best way to throw some light on them is precisely, I think, to fix our attention on some particular case, on some concrete country, and to observe whether the different scientists of that country have or have not something in common, some definite standards and ideals which may be called their own.

Such a problem has little or nothing to do with the enumeration of the notable discoveries achieved in such and such country. A true discovery, being the mastering of some new piece of universal truth, *must* have an objective and therefore an international value. The greater the discovery, the more impersonal it is. So that the prevailing custom, which makes us call discoveries and laws of nature by the names of persons is, in point of fact, just as misleading as it could be.

But the objective discovery is not all of science. It is only the end of it, the result obtained by scientific work, that is, by human activity. Furthermore, any single discovery has to be linked and compared with other discoveries and hypotheses: as soon as it is acquired, it becomes part of a theory which is largely contingent and human. Now, on the one hand, it is a well known fact that there is no sure method, no marked and traceable path for obtaining scientific discoveries; only by trying and trying over again, by toiling, approaching questions from various sides, opening our minds to inspiration and intuition, may we hope to fall upon the idea which will lead us to discovery. *Theories*, on the other hand, are always provisional and changeable, and there is no absolute standard to fix their value. This being so, is it not to be expected that the type of education a man has been given, the habits of mind which he has acquired in life, the models which he finds before him, the general ways and inclinations of his surroundings, will have a notable influence on his methods and on his work?

There are surroundings, there are countries in which, for some reason, some kind of work is more likely to succeed than in others, in which some discoveries have a greater chance to be arrived at, in which some types of scientific system are more likely to spring up. The influence so exerted is felt even by foreigners and it is worth while studying it. I said a moment ago that to associate names with discoveries is a task void of any real interest. But, on the other hand, it is not uninteresting to learn that the Wright brothers achieved decisive success and gave a great impetus to aviation while they were working in France. To take a more convincing example, it is interesting to know that the great scientist and philosopher of Hanover, Leibniz, did come to Paris as a young man and found there the inspiration and the ideas which led him to his first discoveries.

What was it that Leibniz and many other scientists of his time and other times have found on French soil more than they did elsewhere? What are the qualities that have made French scientists often successful and given them followers all over the world? On the other hand, can we trace any characters of scientific *theories* which are especially appreciated by the French and are generally apparent in their productions? Such are the questions which I would try to answer, considering first the tradition of scientific work in France, and second its present condition.

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The traditions upon which modern French science is based were laid down during the first half of the seventeenth century.

This does not mean that science was not an important factor in ancient French civilization. As a matter of fact, the part played in the first revival of science by the University of Paris, the oldest in the Western World, has been exceptionally brilliant. However, the merits of the work then done are not exactly of the type which can be contemplated from a national standpoint. Science in the Middle Ages was highly international, more international than it has ever been since. Besides, the brilliant era started by the old University of Paris was followed by a period of comparative obscurity. Science was again at a standstill until the revival of the study of the original Greek treatises gave it a new impetus. Later still came the time when a reaction against too close an imitation of the Greeks was deemed desirable and when it became apparent that new ways should be tried. Then it was that the national character and national ideal had an opportunity to show themselves. This happened in France at the very moment when French literature, French art, French culture generally, reached their highest point. The time of Corneille, Molière, Bossuet is also the time of Descartes and Fermat. There is a deep significance in that fact, and it is not through a mere coincidence that a man like Pascal

was as famous as a physicist and mathematician as he was as a moralist and as a writer. Pascal, by the way, might be regarded as a fair representative of the French scientific spirit of his time. Descartes, however, is the leading figure. Descartes stands first, not only because his influence has been the widest, but because he was the man who realized fully that the old conceptions were to be changed radically. He was the man who had the clearest and most prophetic vision of a new type of science.

But, before trying to define Descartes' position, I wish to make a few preliminary remarks.

In the system of knowledge which forms a science, two kinds of elements are fundamental: First, the logical deductions or constructions, which combine abstract principles, notions or statements; second, the facts, which are either experimental facts or such facts as may be found in pure mathematics.

The logical aspect of science had been dominant in the work of the Middle Ages. During the later period of its evolution, at least, scholastic science was based chiefly on logical constructions. Such a science will not be worthless if it happens to rest upon solid foundations. But it is likely to become, in most cases, a purely formal and abstract system, which will care little about the value of its material as long as its deductions are correct and consistent. The weakness of scholastic science was that its aim was not definite, its development was not guided. Logical combinations, worthless for any practical purpose, without any appeal to human intelligence at large, may be piled up and piled up and form an endless chain. Huge books have been filled with them, the aspect of which is somewhat terrifying nowadays. It took a man's life to write one of these books and years to study it. And the trouble was that scholars were actually compelled to read all those books; for, to prolong the chain of science, one logically had first to go through the whole length of it. So that scholastic science could not but soon degenerate into hopeless erudition.

The case would be very nearly the same for a system of knowledge based on the second kind of elements, which we have discriminated in science; namely, *facts*.

In the age of Descartes, to be sure, no attempt to build a science on facts only had ever actually been made. Experimental work was still in its infancy. However, a man like Descartes, who was fully aware of the value of such work, could not but perceive the danger which a science based on experiments would have to face. The danger was to pile up facts without the guidance of reason. Such a task would be entirely indeterminate just as is the piling up of logical propositions. It would be endless, and a man might consume his life in this task without becoming any wiser.

Notwithstanding this danger, the kind of science to which I am now alluding is still favored, in our own time, by a few scientific circles.

Arguing that theory is always open to doubt, while a fact in itself, is something solid, there are men who believe that the scientist's activity should all be concentrated upon this one aim: *to acquire new facts*. The men who are promoting such views do not always realize that *their* science—although very different as to the materials from the old scholastic science—will be exactly the same in spirit; or rather it will be the same in the lack of spirit. Accumulation of particular truths, but no leading principle, no illuminating light. Erudition exalted. Discrimination and intelligence secondary. A cumbrous, aimless, hopeless and dead science.

It is against such an ideal, such a conception of science that René Descartes took his stand.

Descartes was endowed with a revolutionary turn of mind. He had, as far as science is concerned, no respect whatever for tradition. Even Greek geometry, which we consider so perfect, is condemned by him. He mentions that all scientific productions of former generations are entirely worthless.

All that we know of Descartes, indeed, is in sharp contrast with the figure of the old schoolman.

First of all, Descartes is *not* a professor.

In the Middle Ages and later, most of the students of science were engaged in the teaching profession. Secluded from the world of action, they were anxious not to let any outsider intrude into their field of knowledge. They jealously closed the doors of science in the face of all Philistines.

Not so with Descartes. How could a man with his temperament be contented with university routine? From his youth, Descartes had felt inclined to live an active, independent and dangerous life. He travelled all over Europe, he was a soldier and fought in Holland and Germany. Later he moved from one place to another, not being able to settle anywhere until he met with a premature death in Sweden.

These facts we have to bear in mind if we want to understand, not Descartes only, but all the great French scientists of the same time. Fermat, who is considered by many as the most prominent mathematician of that age, was not a university man either, but a judge at Toulouse. Desargues, famous among geometers, was an engineer. Pascal was a private gentleman, self-taught.

The lives of all these learned men were widely different. And yet they all had something in common and belonged to the same class. They represented the type which the French of the seventeenth century called an *honnête homme*. To all of them the scholar of the scholastic type is equally abhorrent. He is the man who has been so fitly

ridiculed by Molière, in the *Thomas Diafoirus* of the "Malade imaginaire." Diafoirus is a reputed magister, who has much dialectic ability, but no judgment. The *honnête homme* does not boast of any special acquirements or training, but is richly endowed with good, simple, common sense.

On that notion of "good sense" (*bon sens*) is based the whole Cartesian theory of science. According to Descartes, *bon sens* is a common property, a common gift of which all men have their share. It is the power which men have to act and think not only in agreement with their bodily experience and with the laws of logic, but in agreement with reason.

From this view an obvious inference follows. Science shall not be the exclusive property of specialists any more. But it will be open to laymen; and the layman will even do better than the specialist because he will not indulge in formal erudition and bluff, but his aim will be to make science clear, simple, well ordered, intelligible to any sensible human being, and to make it a living, instead of a dead thing.

The chief characteristics of such a science may be summed up as follows:

First of all, as we just said, science will be *simple*. A scientific system which would lack simplicity would be wrong.

This, I admit, will be considered by many as a bold and rather imprudent statement. We certainly agree with Descartes when he condemns those conceited scholars who are prone to make science complicated just for the sake of appearing as great men in the eyes of ignorant people. But why, indeed, should we believe, and believe on principle, that a science explaining the laws of mechanics, physics and other natural phenomena, is bound to be simple or can be simple?

To confirm such an opinion, Descartes feels compelled to build an elaborate metaphysical system which, according to philosophy, is now a thing of the past. As a scientist, however, we may think that Descartes was right; for the conception of science, which, after many trials, mankind has finally reached, seems to vindicate his statement. Not that science will be just as simple as Descartes thought. But we have come to regard science largely as an arbitrary construction which justifies its course and its hypotheses chiefly by being convenient and simple.

The second characteristic of Cartesian science is that it will *not* be, in any respect, a collection of data or propositions. As we don't know beforehand what data, what deductions, what theorems will be needed for future scientific or practical purposes, therefore, Descartes would say, it is quite useless to gather and hoard such commodities in advance. What we need is a *method* which will give us the power to get the data and to get the propositions as soon as we require them.

A third fundamental characteristic of science—which is not explicitly defined by Descartes himself, but follows from his conceptions—relates to the sort of work which the scientist of high rank has to accomplish, and to the special abilities that are required of him.

Since the task of the scientist does *not* consist in piling up data and reasonings, but in presenting a few clear, comprehensive and far-reaching notions, it follows that this task will be chiefly one of choice and discrimination. Not all the things that are true are useful and worth saying, but only a few, which the intelligent man has to pick out and to discriminate.

How will such a discrimination be carried out? There is no ready answer to this. The question is one for intuition, for intelligence and foresight to decide. To choose the fundamental notions or *hypotheses* on which a scientific construction will be based, to select a *plan* for this construction, to find out the *tests* which will help to compare the construction with experiments, all this forms the most delicate part of the scientist's task. And the most important part too. Between the man who is only capable of deducing and combining ideas or data and the man capable of making the right choice, there is the difference which divides scientific ability from genius.

Let us finally mention a fourth characteristic of Cartesian science, which concerns its form, not its contents. It is quite obvious that, *if* a scientific system is to be simple, comprehensive, and built up with discrimination, the presentation of this system will have to offer corresponding qualities. It must be brief; it must be well ordered; it must be expressed in precise, well chosen words; above all it will be *clear*.

Boileau said, "ce que l'on conçoit bien s'enonce clairement." The reverse is also true. If an idea can not be clearly worded, there is ground to fear that it is badly conceived. The fact that a scientific statement is expressed clearly is the test showing that the statement is sound in regard to reason and is properly discriminated.

A fine example, in this respect, is set by Descartes himself in his "Geometrie," a treatise which, just in a few pages, lays the foundations of analytical geometry. Another beautiful example is found in Pascal's dissertations on hydrodynamics, which have often been described as being as many little gems. But I can not enter here into a survey of the *results* to which the Cartesian principles have led. My object was simply to show how these principles have been introduced into science and what they do mean.

They were, as we have seen, the natural outcome of the views held by the best French scientists of a time in which modern thought generally, and French thought particularly, began to develop on new and most promising lines. Descartes had a clear conception of the

type of science which was wanted in his age. However, the promise then given of a sound rational science, as opposed to a purely logical or merely empirical science, was not actually made good until a much more recent date. If we except pure mathematics, or rather some parts of pure mathematics, the system of science on which we rely today was not actually framed, in its present shape, before the end of the eighteenth century. Then it was that the older sciences, like analysis, physics, chemistry, were placed upon really strong foundations, while biology and all the new sciences were just emerging from the chaotic state. The nineteenth century has justly been described as the century of science. It is therefore of special interest for the student of French civilization to see how France has played her part during that most remarkable period.

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It was shortly before 1800 that, after a period of comparative stagnation, a new revival of scientific thought became apparent in France. Curiously enough this revival took place at a time which does not seem at all favorable—in the midst of the French revolution and the Napoleonic campaign. This is a strange coincidence. But we must remember that the French scientist of Descartes' class is not bound to be an indoor scholar or a white-bearded doctor. For him, there is no contradiction between learning and life. Rather would he believe that active life is an inducement to scientific work, that the great expenditure of energy which comes from danger is likely to give an impetus to science itself. So did it happen that the period about the year 1800 was one of great scientific production, and the very men to whom we owe that production have played a personal part in the great drama which was then shaking France and all Europe.

A few names will be sufficient, I think, to prove the correctness of this association.

Lazare Carnot, born in 1753, was one of the promoters of modern geometry. But, at the same time, he was an army officer and a statesman. He proved a most efficient minister of war. He was one of the first to discover Napoleon's ability and himself deserved the title of "organisateur de la victoire."

Another member of the Carnot family, Sadi Carnot, one of the founders of thermodynamics, was also an army officer engaged in active service.

Gaspard Monge was a great inventor in geometry. But he took an active part in the Revolution, was a state minister and a member of Napoleon's expedition to Egypt. Other members of the same expedition were Geoffroy-Saint-Hilaire, a well known biologist, and Berthollet, famous in chemistry.

Fourier, a promoter of mathematical physics, lived a most threat-



ened life throughout the Revolution. Lavoisier, who is considered by many as the chief founder of modern chemistry, held various posts in the Revolutionary administration, and was finally sentenced by a Revolutionary court and put to death.

Poncelet, a most original geometer, was an officer in Napoleon's army and made his greatest discoveries when a prisoner in Russia.

Arago, a great astronomer born in 1786, was also a strenuous man of action. Just when the war was raging between England and France, he was engaged in the measurement of a geodesic arc in Spain and North Africa. He was taken prisoner a number of times but always managed to escape under the most perilous circumstances.

Such were the French scholars of the beginning of the last century.

But quieter times have come, and the scientist of the Carnot type is now a figure of the past. Occasionally, to be sure, the tradition of 1800 has been renewed. Not to speak of a recent prime minister, there are a number of scientists who have played an active part in French public affairs. Conspicuous among them was Berthelot, one of the founders of organic chemistry, who not only was a senator and statesman, but took personal interest in nearly all fields of knowledge and action.

Berthelot's case is however an exception. Scientific work nowadays, when of the original and creative kind, requires so much time, so much application and concentration, that it can not be easily associated with outside activities. The reverse, however, is not true. It is quite feasible and most useful for a man engaged in active life to be thoroughly trained in science. In this respect, at least, France has preserved the tradition of 120 years ago. To promote scientific thought among men of action, the great inventors of that time had opened a new school, the *Ecole Polytechnique*. Up to the present day, this school has played an important part in the life of the country; through this institution and others, the best French engineers, officers, administrators, are given a scientific training of high standard and many of them thus develop a turn of mind in which we easily recognize the Cartesian spirit: clearness, preciseness, a rigorous method. The scientific ability, the directness of mind of the French artillery officers has often been praised during the war. It is largely due to the training and tradition of the *Ecole Polytechnique*.

But let us turn to the genuine research work done in France and see what remarks may be offered about it.

Coming to this point, I confess that I feel somewhat puzzled. The pure scientist of modern times is not in the least a striking figure. He is a simple man, living a simple life in his study or his laboratory. Many would even suspect him of being some kind of fossil with no passion, no feeling, no human weakness. Of course, this suspicion is

not correct. A man who does creative work is bound to have passions, but not of the sort that break out in every day life. Let us try, however, to discover, under the monotonous surface of his existence some characteristic features of the man.

I have already mentioned the fact that the French tradition, as defined by Descartes, is strongly opposed to the spirit of the old schools of specialists. The modern French student, to be sure, is mostly obliged to specialize. This has become necessary if one wants to do useful work. But the French student rather regrets this restriction on his activity, and he has none of the specialist's tastes or manners.

A natural consequence of the specializing habit is the way in which followers of the same line (the same *Fach*, as the Germans would say) are wont to associate together and live a distinct life. In so doing modern specialists are quite in keeping with the old custom. The old universities were precisely such associations of learned men who conversed and discussed among themselves without any regard for the opinions of the lay people outside. Their one aim was to gain authority and influence over their own kind. And the ambition of every young scholar in former times was to become a professor, a magistrate in his turn, and to be surrounded by a crowd of docile followers.

The scheme is not altogether a bad one. Anyone, I think, who has studied in one of the older German universities must admit that *there*, at least, some of the traditions of the past have been preserved with great advantages to all concerned. In the quiet city of Göttingen, among the woods and hills of the Hanover province, famous professors, a few years ago, still lived the same learned, methodic life which their predecessors had led. They worked in close association with their students. They ate and drank with them. They guided them step by step. And they used to share with them their intimate thoughts, their hopes, the difficulties which they met in their own researches; thus occasionally getting valuable assistance from the same young men whom they helped to get a start in academic life. The deep humility of many a student in such surroundings, his complete submission to his master, were rather surprising to the foreigner; but it can not be denied that the cooperation which such a submission made possible was followed in many cases by remarkable results.

In France, however, the ways of scientists and the conditions of university life are of a different type.

Like Descartes, the French student of science is mostly a man with an independent turn of mind. There lies his strength as well as his weakness. Working alone, and avoiding too frequent contact with his fellow-workers, he may thus have a better chance to discover really new and unexplored ways. He is less exposed to the danger of having his vision obscured by tradition, by opinions or prejudices of other

men, by the natural inclination to imitate. But, on the other hand, there are some kinds of work in which a single-handed man, whatever be his own resources, is not likely to succeed, in which some sort of cooperation is highly desirable. This is specially true of laboratory work, where a long series of delicate experiments is required. In this respect many Frenchmen will frankly admit that they have often been somewhat deficient. In organized scientific work, in teamwork, France is not as successful as she might have been. However, it should not be forgotten that, so far, the most original, the deepest discoveries have not been obtained by teamwork. And it is not unusual that one single man, in a small, inconvenient laboratory, lacking all modern conveniences, will make a striking discovery. Such was the case of Pasteur forty years ago. Such has been the case of the Curies.

To the individualistic turn of mind of the French man of science is probably due the fact that the intercourse between teachers and pupils is not in French universities what it is in a place like Göttingen.

We have seen that Fermat, Descartes and Pascal were not university men. Even at the present day, the French scientist, although he usually teaches in some university, is not exactly the man whom most people would call a professor. He does not associate with his students as closely as the typical teacher does. Henri Poincaré, for instance, was often described as being peculiarly closed and inscrutable to the many who came to study under him. He utterly disliked to speak about his own work while it was going on. He believed that absolute concentration was necessary to bring forth original thought and that academic intercourse, during the period of invention, could not but spoil the process. This view, it will be noticed, is in perfect agreement with the Cartesian principles. According to the French notion science is by no means the result of addition, of accumulation of knowledge and research. It is an accomplishment of reason, an act of direct intuition, which can not be divided and can not be made easier by combining the brains of several people.

It would be, however, quite a mistake to believe that French professors don't care to have frequent and friendly intercourse with their students. Henri Poincaré was much interested in beginners. But he did not try to impress his ideas upon them. He was rather anxious to get out of them the ideas which they might be forming in secret.

French students, like those of some other countries, are rather fond of criticizing. They have not too much respect for their teachers and sometimes follow their leadership chiefly by taking opposed views. Now you will find that the French professor, as a rule, does not try to check that tendency. He knows that there is an exaggeration in it, which will wear out with youth; but he thinks, as Descartes did, that a young, vigorous, not too scholarly mind, even if it has not yet hoarded

a big amount of knowledge, is apt to fall upon new and original ideas which a more experienced man might overlook. He believes in the power of fresh minds, not hampered by erudition, and he does his best to stimulate such minds.

The conditions which I have described so far as prevailing in modern France relate chiefly to creative work and invention. Invention, however, is only one part, the most important one, of scientific activity. Another part is the presentation and explanation of the facts and ideas, the making of a system or theory.

What shall we call, in science, a *theory*? This point we touched already when we were discussing Cartesian science. But it is only in recent years that the meaning and purport of constructive theories have been distinctly recognized; and French scientists and philosophers have helped much to clarify the question.

The French idea is—let us repeat it once more—that it is less important to collect data than to make a pertinent choice between them and to order and handle them according to clear principles, well reasoned out. From this it follows that the French scientist is bound to pay special attention to the requirements and to the merits of theories.

In what respect may we say that a scientific theory is contingent? To what extent is the theory a thing of our own making, the result of our own discrimination? To what extent, on the other hand, is it imposed upon us from the outside by an external necessity? Such were the problems which several French thinkers have discussed at length from the point of view of modern science.

The conclusion reached was quite in keeping with Descartes' view, namely, that the best science is the one which is most convenient and simple. Many different systems of science would be equally correct (for instance non-Euclidean geometry is just as true as Euclidean geometry). But only the science which is simple will be commendable.

It is not for me to discuss these views from the standpoint of philosophy. The metaphysical questions which they call forth may be debatable. But the scientific conclusions and precepts which men like Henri Poincaré cultivate have often been described as a scientific form of pragmatism. This is partly, but only partly true. To describe that position correctly we have to bear in mind that the Cartesian conceptions are still dominant in France. We are trying to mould science so as to make it simple. Now what does the word "simple" mean here? Is it exactly the same thing as *convenient*? Descartes' answer to this question is based on principles which don't satisfy us today. Yet his leading idea has survived; namely, that simplicity in science does not mean primarily practical convenience, but rather means being simple in regard to *reason*, in regard to Cartesian *good sense*. The constant

aim and preoccupation of the French scientist, when he makes up a theory, will be to take reason for his guide.

But if we put the matter so, one may ask, how then shall we define that faculty of reason on which we cause all science to rest? This question the modern scientist will not answer. It is beyond him. He is not as bold as Descartes and does not venture to describe reason. But he firmly believes that he knows quite distinctly, quite definitely, what a theory is to be like if it is built in accordance with the precepts of that undefined faculty of reason.

Take, for instance, the modern theories of physics as they grow in the hands of such great scientists as Hertz, Maxwell, Oliver Lodge, and see what becomes of the same theories when they are accommodated to French taste by Henri Poincaré, Duhem, Langevin or Perrin. You will recognize at once that the said theories are distinctly modified when they cross the borders of the different countries—which shows that there is really such a thing as a national ideal in scientific construction.

A striking feature in the books of many great English scientists of recent date is the constant appeal which they choose to make to material illustration, to concrete images and comparisons. Open an English treatise of electricity, Pierre Duhem used to say. You will be surprised to find there constant talking about strings, ropes, wheels, pulleys, waterfalls and so on. It seems, indeed, that such comparisons and interpretation are a distinct help to the English mind. It would not be quite so with the French mind. The French would think that this repeated resorting to imagination is rather likely to obscure the deep meaning of the theory.

Let us take, now, some German treatise of the first rank on the same subject. There we find a predilection for abstract, logical, well deduced constructions and mathematical reckoning. No material illustration of the facts, no attempt, even, to justify the long work except when it comes to be concluded. The peruser of the treatise is expected to be a disciplined, docile sort of man who will take the trouble of going through the whole, of devoting himself to hard reading without knowing beforehand where he is taken to and why he is asked to go that way. Science, so conducted, is chiefly a formal system. It may finally lead to practical applications, but, all along the way, you don't know whether it will; and the useful construction does not differ in form and character from any other which would be useless.

The French point of view in such matters is somewhat different. It is neither the English nor the German standpoint just described. The leading feature, in the presentation of a theory of physics in France is neither concrete interpretation nor pure deduction and computation.

Few images, to avoid dispersion of the mind, and a logical apparatus as reduced as possible, to avoid obscuration of the ideas by the

formal elements of deduction. The ideas themselves as clear, as obvious, as approachable to common sense as they can be. Such will be for the French the ideal theory.

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I have tried to define, in the preceding pages, the features which seem to be most apparent in the personality, the work and the achievements of French men of science. To close this article, I confess that I have no definite conclusion to offer; nor would it be safe to synthetise any more an account which is already too schematic. In fact, real conditions can not possibly be as simple as one might infer from this account. The tendencies which I have tried to point out are often more potential than actual and only half—if at all—conscious. The exceptions, also, are numerous, so that any synthetic picture, like the one I have had in view, can never be more than partly true. But should the picture, for this reason, be dismissed as illusory and devoid of any practical value? I don't think so. When there is so much talk about exchanging professors, students, ideas, between distant nations, I believe that it may be worthwhile to emphasize, even with some exaggeration, the traits that are most likely to affect a would-be visitor to a country. This may help to avoid misunderstandings. If science of the type which I have described is to your liking, then go to France and you will probably come across some good representatives of such a science. If it disagrees with you, then stay at home and be indulgent.